Contouring NC

- Contouring is the most complex, the most flexible and the most expensive type of m/c tool control.
- Capable of performing both PTP and straight-cut operations.
- Capable of controlling more than one axis movement of the m/c tool.
- The path of the cutter is continously controlled to generate the desired geometry of the workpiece.

(Thus called Continous-path NC System)

- Straight or plane surfaces at any orientation, circular paths, conical shapes or any mathematically definable form are possible under contouring control.
- In order to machine a curved path in NC contouring system, the dirn of the feed rate must continously be changed so as to follow the path.
- This is accomplished by breaking the curved path into very short straight-line segments that approximate the curve. Then the tool is commanded to machine each segment in succession.

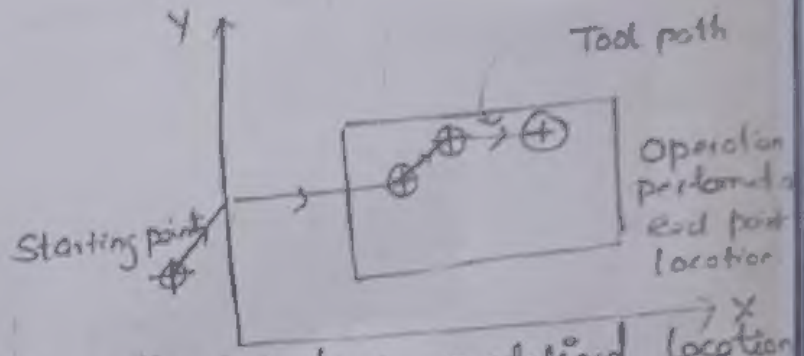
Applications of NC :-

- Milling
- Drilling
- Turning
- Grinding
- Sawing
- Boring

NC MOTION CONTROL SYSTEMS

- In order to do the machining process, the cutting tool and workpiece must be moved relative to each other
- In NC, there are 3 basic types of motion control system
1) Point-to-point (PTP)
2) Straight cut
3) Contouring

Point-to-point NC

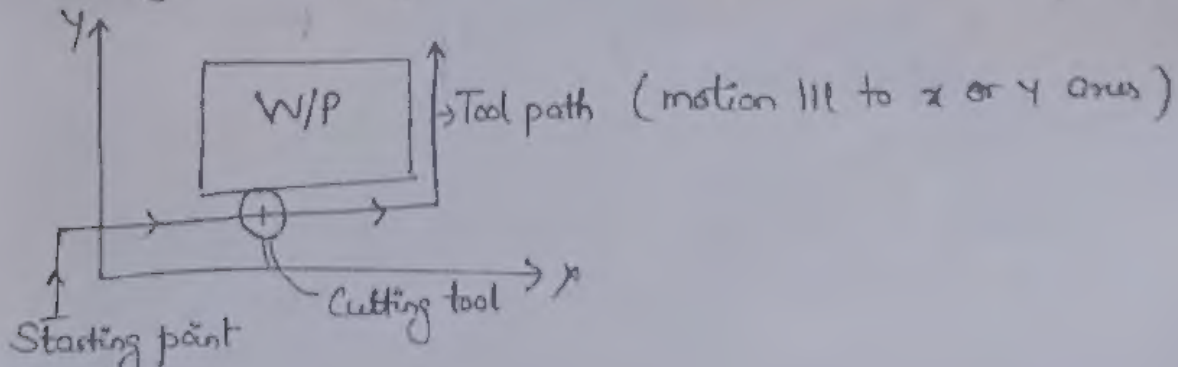


- Also called 'Positioning System'.
- The objective is to move the cutting tool to a predefined location
- The path or speed by this movement is done is not important in PTP.
- Once the tool reaches the desired location, the machining operation is performed at that position.

Ex:- NC drill press.

Straight-cut NC

- Straight-cut control systems are capable of moving the cutting tool parallel to one of the major axes at a controlled rate.
- It is appropriate for milling operations to fabricate workpieces of rectangular configurations.



Where NC should be used :-

(1) Parts are procesed frequntly and in small lot size
(2) The part geometry is complex
(3) Many operations must be performed on the part in the processing.
(4) Much metal needs to be removed
(5) Engineering design changes are likely.
(6) Close tolerances must be held on the workpart.
(7) The parts require 100% inspection
(8) It is an expensive part where mistakes in processing would be costly.

Advantages of NC.

(1) Reduced non-productive time :- Fewer setups, less time in setting up, reduced workpiece handling time, automatic tool changes on some machines, etc.

(2) Reduced fixturing :-
NC requires fixtures which are simpler and less costly to fabricate. because the positioning is done

(3) Greater manufacturing flexibility :-
With NC, it is easy to adapt to engg. design changes alterations of the production schedule, etc.

(4) Improved quality control :-
NC produces parts with greater accuracy, reduced scrap & lower inspection requirements

(5) Reduced Inventory :- Owing to fewer setups & shorter lead times, with NC, the amount of inventory is reduced.

(6) Reduced floor space requirements :-
Since one NC machining center can do the production of several conventional machines, the amount of floor space required is less than in a conventional shop.

DISADVANTAGES OF NC:

(1) Higher Investment cost

(2) Higher maintenance cost.

(3) Training NC personnel:- (Requires higher skilled and more
Conventional operators)